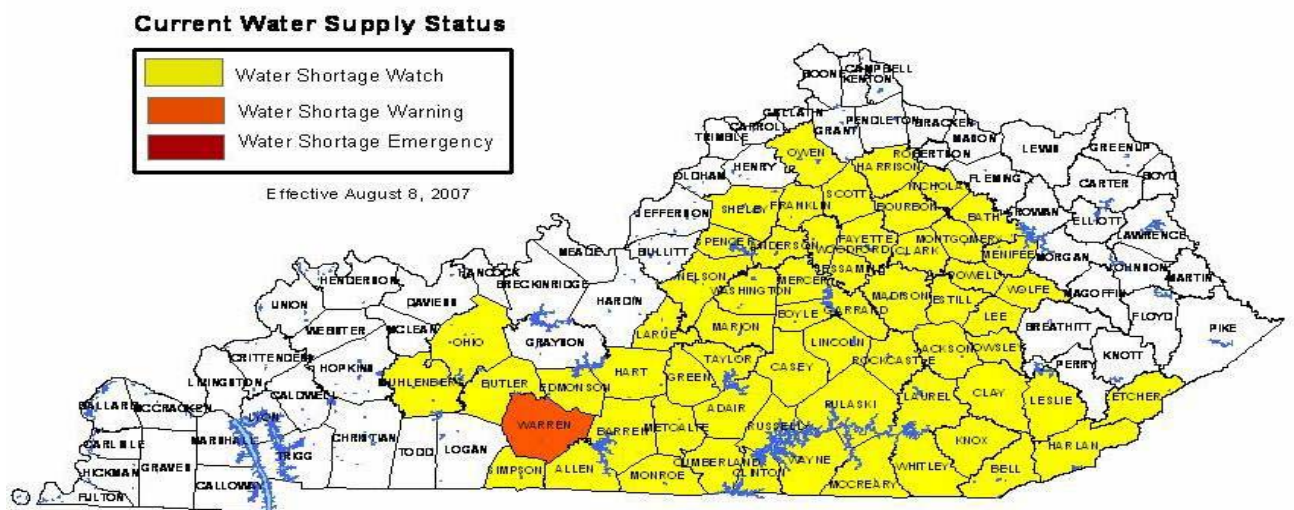


Drought

The Kentucky Division of Water continuously monitors hydrologic conditions throughout the state, including precipitation, streamflows, lake elevations and various drought indices. This information is used to detect emerging drought conditions, to identify the locations and severity of drought and to provide timely and appropriate public notification.

Kentucky Drought Monitoring Center



***UPDATE* Aug. 9, 2007 - State Places Warren County on Water**

Shortage Warning (To view press release please [click here.](#))

[Water Shortage Notification System Explained](#)

****Read the latest National Weather Service drought
statement [here.](#)****

Statewide Summary of Drought Development

 **Updated Aug. 22, 2007** 

Soaking rains on Aug. 20-21, 2007 brought some improvements to agricultural drought conditions across the northern Green, most of the Salt, and portions of the lower Kentucky River basins. Rainfall amounts of 2 to 3 inches were common across the Salt River basin, easing drought conditions in some areas that had seen very little of the scattered showers and thunderstorms of July. Similar amounts were recorded in and around Fayette and surrounding counties extending as far east as Wolfe County. The positive effects of this precipitation will be exhibited mostly in the form of improved surface conditions: pastures, shallow wells, ponds and urban landscapes. Perhaps more importantly, this "dent" in the drought should be instrumental in helping to reduce the demand for outdoor water use that has caused problems for some water systems.

Extreme hydrologic drought is in place for a large portion of Kentucky. A majority of the Western, Central and Eastern climatic divisions have seen little or no rainfall since the end of July. September and October are typically the driest times of the year and climatic outlooks offer only an equal chance for normal, above-normal, or below-normal rainfall through October.

Water supplies on rivers such as the Licking, Green or Kentucky originate from hundreds of square miles of runoff and drainage that flow from small headwater streams, to larger tributaries, to the mainstem of the river. Storms that bring rain to one part of a basin may do very little to improve the overall drought status of the basin in terms of flow in the larger rivers. It is important to not confuse meteorological drought (a deficit of rainfall) or agricultural drought (soil moisture deficits) with hydrologic drought (streamflows, springs, groundwater levels). The first two types of drought can be substantially improved by a single, soaking rainfall event. Hydrologic drought develops over a long period, has a more regional impact and requires large regional rainfall events to return to normal conditions. Rainfall events that temporarily relieve surface drought conditions and brings greenness back to lawns may have very little impact on the drought that affects the regional drought status of water supplies.

It is important for Kentuckians to remain aware of the conditions that can lead to water shortages. High temperatures can encourage high demands, mostly in the form of outdoor water use. Some cities may see increased demand as children return to school or as colleges and universities resume classes. It is a good idea for all of us to take the time to consider our individual water use and identify specific actions that can be taken to reduce demand on our local water supplies if asked to do so by local water suppliers.

Useful Drought Indicators

PRECIPITATION

Precipitation for the past 30 days in the Eastern, Bluegrass and Central climatic divisions averaged 77 percent of normal (68, 92 and 72 percent of normal respectively) while the Western climatic division received an average of only 17 percent of normal.

STREAMFLOWS

Recent precipitation has caused a temporary reprieve from the decrease seen in many streamflows across the major river basins. Without continued timely precipitation, expect many streamflows to return to below-normal in the coming week.

LAKE ELEVATIONS

While most small water-supply lakes are not abnormally low, they continue to decline under the stress of high temperatures and lack of precipitation. Increased customer demand has forced a number of these water systems to call for conservation measures. Lakes under the control of the [Huntington District](#), [Louisville District](#) and [Nashville District](#) of the U.S. Army Corps of Engineers continue to operate along their normal lake elevation curves. Two exceptions are the Barren River Reservoir in Barren County and Rough River reservoir in Breckinridge County. Barren River reservoir is having difficulty bringing the elevation to normal pool and is currently down by 4.0 feet. Discharges from the dam have been at or near the minimum release most of the time since Mar. 20, 2007. Releases from Corps of Engineers reservoirs are important to the status of many Kentucky rivers as sources

of supply for drinking water, assimilation of wastewater discharges, water quality and aquatic habitat. These rivers include the Green, Barren, Rough, Nolin, Kentucky, Salt, Licking and Big Sandy rivers.

DROUGHT INDICES

Assessing the severity of a drought is made easier with the use of drought indices that combine various source information into a single representative value of drought severity. The [Palmer Drought Severity Index](#) uses data for precipitation, temperature and evapotranspiration (the water returned to the atmosphere through the combined actions of evaporation and plant growth) to calculate a number that can be compared across different times and locations. This index was developed in the 1960's in Kansas and Nebraska but has since become a part of drought monitoring in a majority of the United States. The Palmer Drought Severity Index is updated weekly on Monday afternoons.

The [Drought Monitor](#) represents a comprehensive assessment of several factors that contribute to the development of drought or that indicate the severity and potential persistence of drought. The Drought Monitor is updated weekly on Thursday mornings.

 **Updated Aug. 22, 2007** 

The Palmer Drought Severity Index and the Drought Monitor indicate severe to extreme drought across Kentucky.

The Palmer Drought Severity Index issued on Aug. 20, 2007, places the Central, Bluegrass and East climatic divisions in severe drought status. The West Climatic Division (-4.18) has fallen into Extreme Palmer Drought.

It is important to note that the Palmer Drought Severity Index is used as a general index of drought over large geographic areas defined by the four climatic divisions of Kentucky. Rainfall that affects one part of a climatic division may substantially improve drought conditions on a county or multi-county level but have little or no impact on the regional average conditions defined by the Palmer Index.

 **Updated Aug. 22, 2007** 

The Drought Monitor now places a majority of the state into extreme agricultural and hydrologic drought status. Areas along the Ohio River, north of a line from Henderson to Grayson to Mason counties remain in severe drought status. The borderline between severe and extreme drought passes directly across areas of central Kentucky that received 2 to 3 inches of precipitation on Aug. 20-21, 2007. Some degree of latitude should be applied to this boundary between severe and extreme drought when assessing local conditions.

As a drought indicator, the Drought Monitor is not limited to four large climatic divisions, rather it incorporates the Palmer Index as just one of several indicators of drought development in a given area. These other indicators include more short-term components including the Crop Moisture Index, Standardized Precipitation Index and weekly streamflow percentiles. The Palmer Drought Severity Index and the Drought Monitor should be considered in combination with more localized data such as rainfall, streamflows, groundwater levels and climatic outlooks to form an accurate assessment of drought severity in a given location.

Drought Monitoring

Drought is a natural and recurring feature of our climate that can be considered a "severe" weather event much like a tornado, a flood or a hurricane. However, there are a few key differences that distinguish drought from other weather events that make it difficult to detect, track and respond to drought.

Part of the difficulty in detecting drought is in the lack of an obvious onset of drought conditions. A drought develops slowly and can appear to mimic a normal spell of dry weather in the summer, a time of the year when dry weather is accepted and expected. Short-term rainfall shortages create problems for agricultural crops, livestock, urban landscapes and other activities that depend on stored soil moisture between rainfall events. We are accustomed to dealing with short-term dry spells in part because there is an expectation that rainfall is just around the corner. However, when rainfall shortages persist for weeks or months at a time, activities that depend on long-term storage of water will be adversely impacted as well. Droughts in Kentucky can have serious negative consequences for drinking water supplies, energy production, commercial and industrial operations, recreation and aquatic habitat.

The negative impacts of drought cannot be avoided but there are ways to reduce them to a manageable level. All water suppliers in the commonwealth should have a water shortage response plan to guide both the supplier and customer during a drought event. It is important for customers to listen to their water suppliers and be ready to take necessary actions to prevent a water shortage problem from developing. This is critical to a successful outcome because the only way to effectively manage the source of water supply is to first manage the demand for water.

There is no easy method for determining when a dry spell has become a drought, how long a drought will persist or how intense a drought may become. However, by closely tracking certain sources of information, referred to as drought indicators, it is possible to detect potential drought development early enough to allow at least some lead-time for notification and initiation of drought response preparations at the local level. The Division of Water monitors for the potential development of drought in Kentucky by tracking precipitation, streamflows, lake levels, groundwater and water supplies. There are also several tools that are useful in assessing the severity of a "dry spell" and the potential impacts to agriculture, forest fires, water supplies and

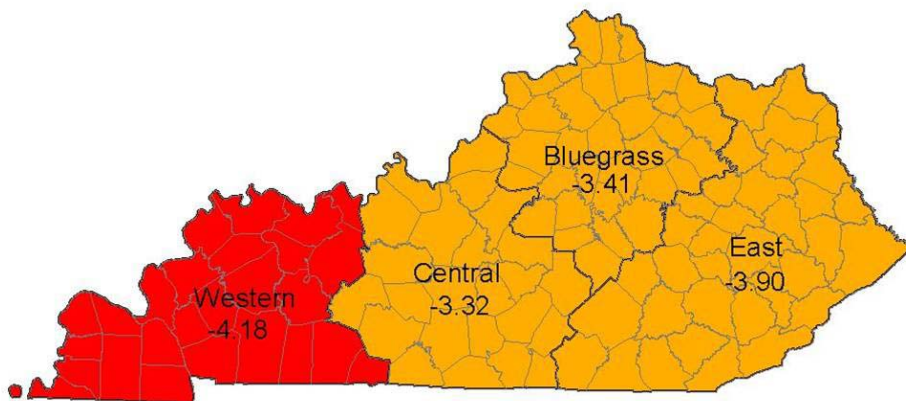
other vulnerabilities to drought. These tools include the Palmer Drought Severity Index, the Drought Monitor, the Standardized Precipitation Index and several others.

The Drought Monitoring pages will be updated on a weekly basis to provide timely information and assessments of current drought conditions in Kentucky. There will also be numerous links to other resources and drought information pages from various state and federal agencies.

 **Updated Aug. 22, 2007** 

Palmer Drought Severity Index The Palmer Drought Severity Index (PDSI) is compiled weekly by the Central Region Climate Prediction Center (National Centers for Environmental Prediction, National Weather Service and National Oceanic and Atmosphere Administration) and provided on the University of Kentucky Agricultural Weather Center's Web site. This index is useful for placing a developing drought into context with past droughts and serves as a measure of current conditions. The index also provides a standardized assessment of developing drought conditions that can be compared between different areas of the state or even between different states.

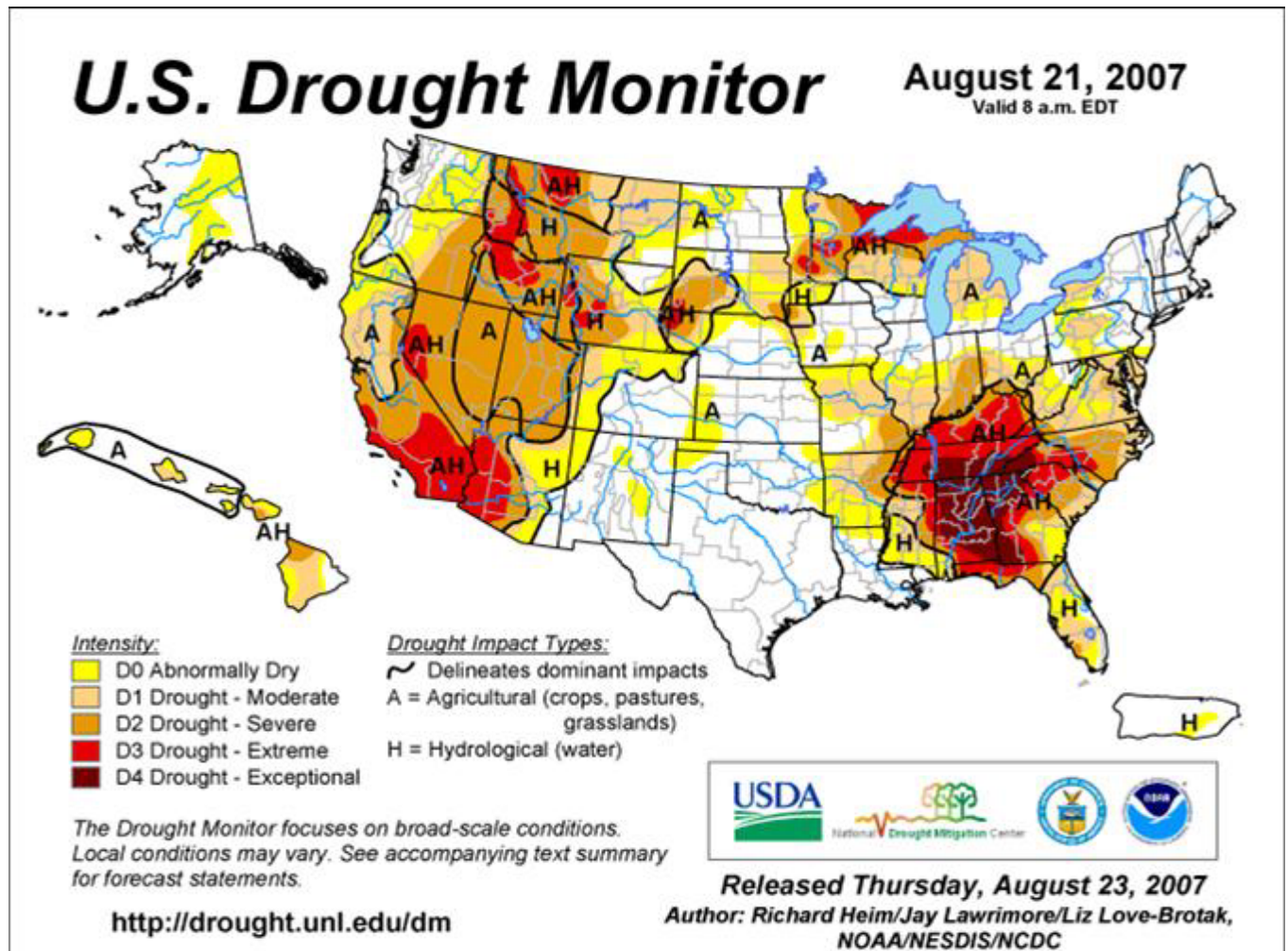
PDSI values can be categorized as follows:



- 0 to -0.99 = near normal
- -1.00 to -1.99 = mild drought

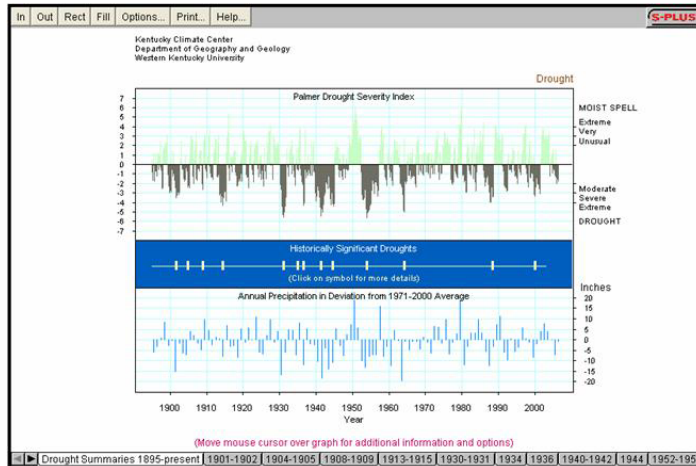
- -2.00 to -2.99 = moderate drought
- -3.00 to -3.99 = severe drought
- -4.00 and below = extreme drought

The Drought Monitor



Tracking drought blends science and art. No single definition of drought works for all circumstances, so people rely on drought indices to detect and measure droughts. But no single index works under all circumstances, either. The Drought Monitor is a synthesis of multiple indices, outlooks and news accounts, that represents a consensus of federal and academic scientists. A detailed description of the parameters used to create the Drought Monitor can be found [here](#).

[Kentucky Climate Center](#) Historical Drought Data



Interactive graphs displaying drought indices since 1895 for Kentucky's four climate divisions. Users can identify and explore the development of historically significant droughts.

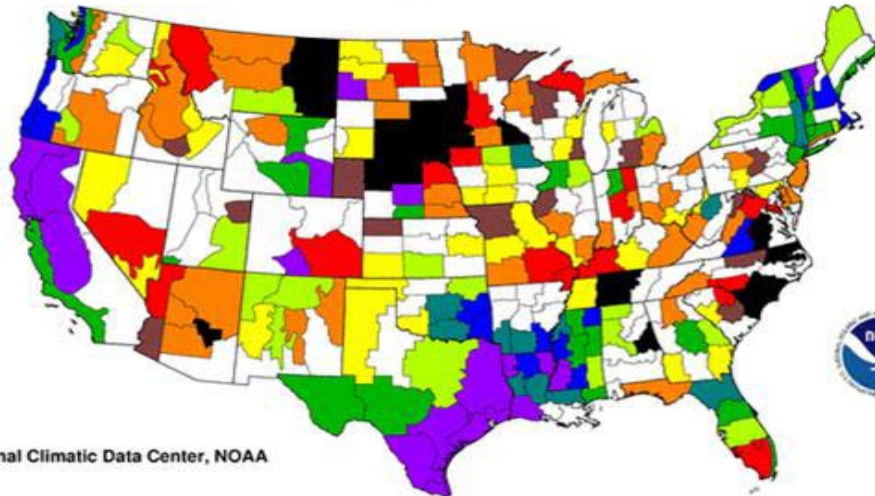
Examining the past can be a useful tool in interpreting the significance of a developing drought situation. Comparisons of the current drought to the historical record provide a frame of reference for evaluating how serious the current drought has become, and how it might develop in the coming months. One of the best tools to evaluate past droughts is found at the Kentucky Climate Center at Western Kentucky University. Click on the figure at the left to visit this site and learn more about the history of drought in Kentucky.

[The Standardized Precipitation Index](#)

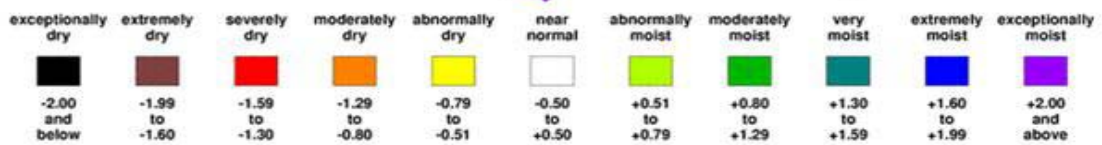
The Standardized Precipitation Index (SPI) is a way of measuring drought that is different from the PDSI. Like the PDSI, this index is negative for drought and positive for wet conditions. But the SPI is a probability index that considers only precipitation, while Palmer's indices are water balance indices that consider water supply (precipitation), demand (evapotranspiration) and loss (runoff).

Standardized Precipitation Index One Month

July 2007

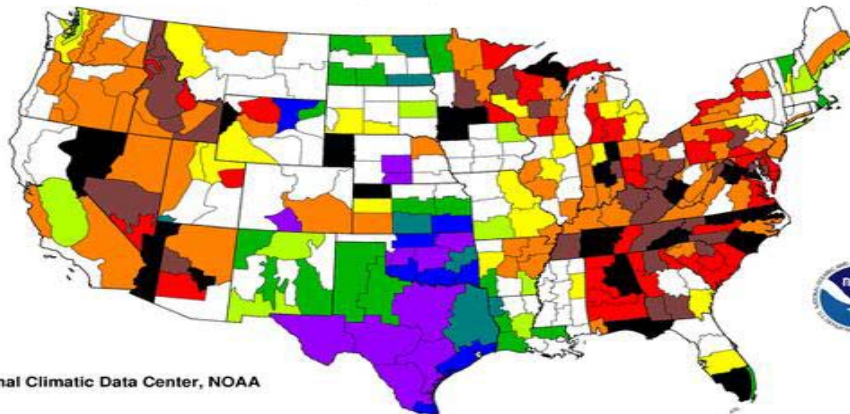


National Climatic Data Center, NOAA

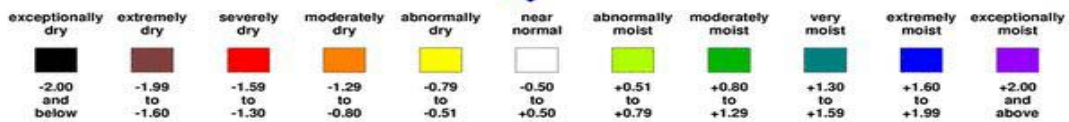


Standardized Precipitation Index Three Months

May-July 2007

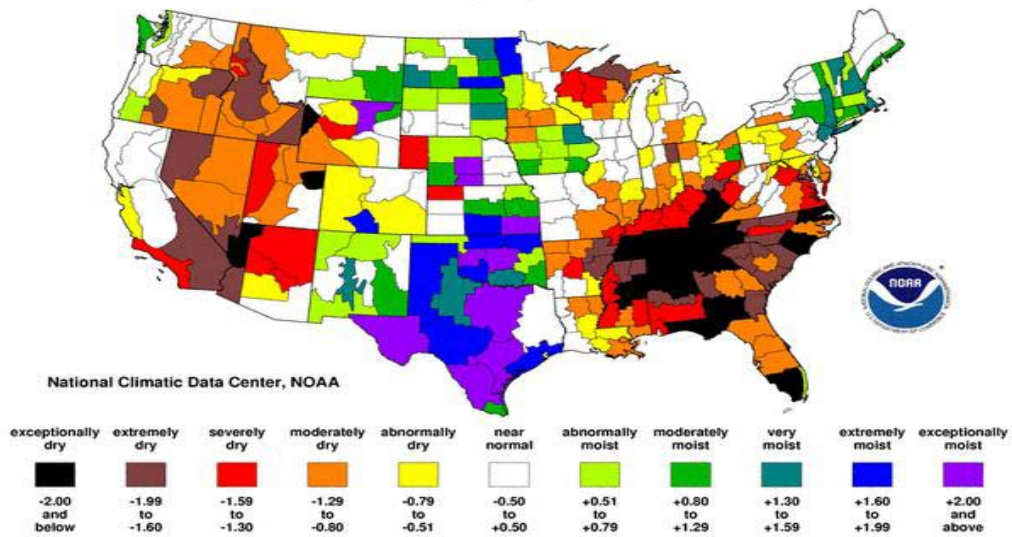


National Climatic Data Center, NOAA

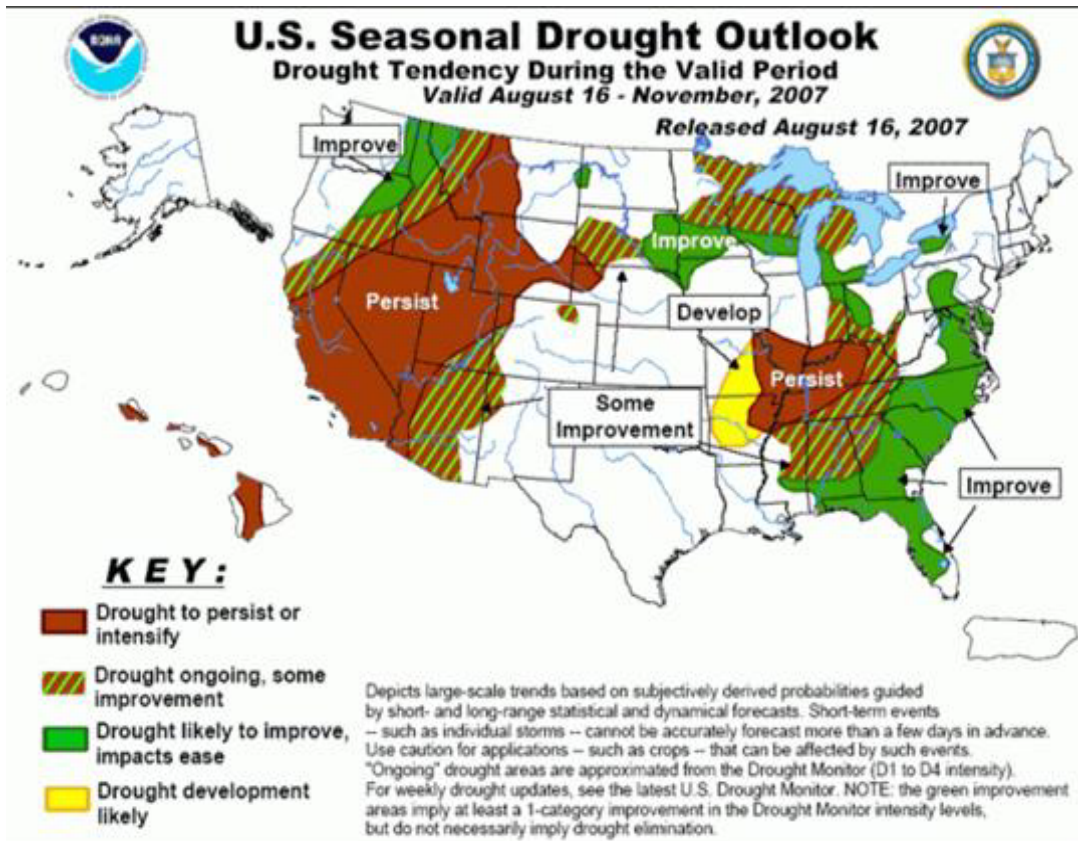


Standardized Precipitation Index Six Months

February-July 2007



U.S. Seasonal Drought Outlook



The Climate Prediction Center issues the U.S. Seasonal Drought Outlook each month in conjunction with the release of the long-lead temperature and precipitation outlooks.

Weather and Climate

PRECIPITATION

The Division of Water monitors a network of 24 daily climate-reporting stations to track developing shortages of precipitation. For the year, precipitation deficits for Kentucky range from 63 percent of normal in the Eastern climatic division to 81 percent of normal in the Bluegrass climatic division.

 **Updated Aug. 22, 2007** 

(Click on images to enlarge)

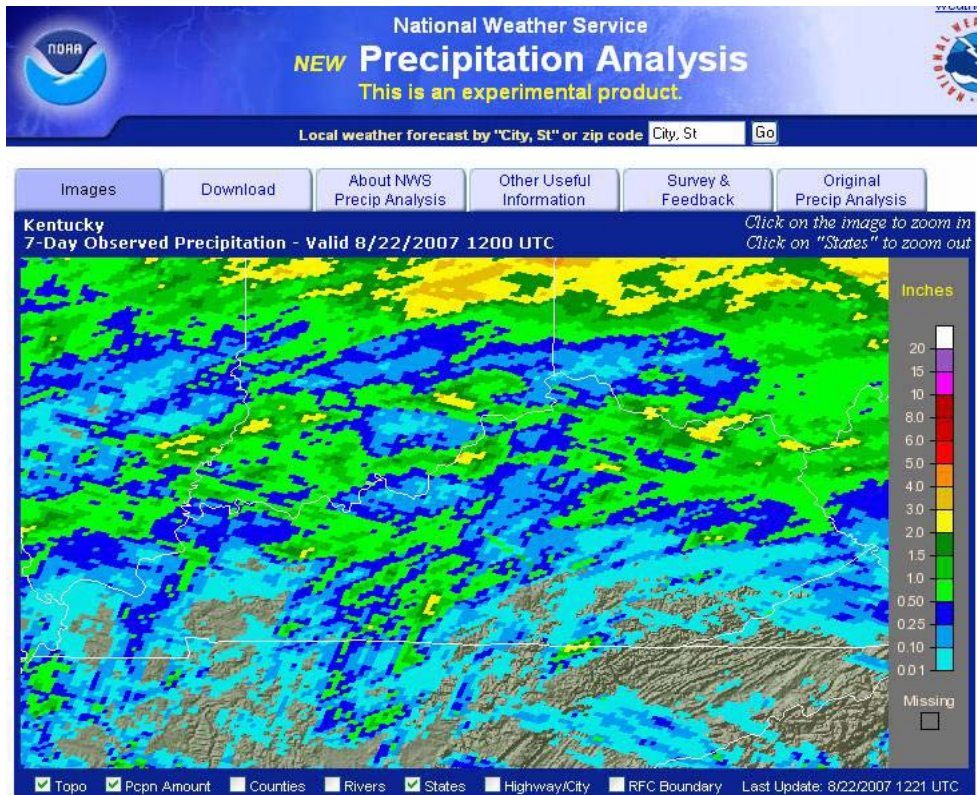
Precipitation: Data for the previous 30/60/90-day period and the Water Year Beginning October 01, 2006

Station	Water Year		30/60/90 Day Total Precipitation and Departure From Normal					
	Precipitation Totals (inches)	Departure From Normal (inches)	30 Day Total (inches)	30 Day Departure (inches)	60 Day Total (inches)	60 Day Departure (inches)	90 Day Total (inches)	90 Day Departure (inches)
Henderson	32.27	1.35	1.29	-3.28	5.88	-2.85	9.26	-4.06
Paducah	33.68	-1.04	2.32	-2.63	5.75	-4.04	8.72	-5.87
Princeton	30.11	-6.18	2.05	-2.88	5.96	-3.64	8.32	-6.07
Mayfield	27.58	-10.52	0.60	-4.16	3.85	-5.93	5.75	-9.21
Louisville	30.34	0.04	1.19	-3.26	6.33	-2.39	9.31	-3.87
Bardstown	27.05	-2.41	0.61	-3.84	5.24	-3.16	8.62	-3.98
Hardinsburg	29.47	-4.05	1.24	-3.48	5.51	-3.58	7.82	-5.70
Campbellsville	29.07	-6.24	1.69	-3.51	7.53	-2.45	11.86	-2.88
Nolin Lake	30.33	-5.12	3.35	-1.90	8.12	-1.79	10.49	-3.60
Glasgow	27.72	-8.33	1.38	-3.63	6.30	-3.32	9.49	-4.98
Bowling Green	25.25	-10.23	2.58	-2.26	6.60	-2.63	7.55	-6.52
Covington	24.60	-3.06	0.92	-3.31	3.46	-4.58	6.07	-6.02
Williamstown	32.10	2.93	1.80	-2.53	5.99	-2.51	12.43	-0.56
Spindletop	21.72	-7.66	1.30	-3.07	4.69	-3.63	7.17	-5.35
Lexington	26.89	-2.48	2.22	-2.14	5.96	-2.35	8.75	-3.76
Dix Dam	24.47	-6.36	1.26	-3.38	5.62	-3.30	9.45	-3.70
Berea	24.11	-6.60	1.49	-3.28	5.69	-3.41	9.30	-3.93
Grayson	24.78	-2.65	1.82	-2.06	5.34	-2.71	8.35	-3.19
Jackson	21.76	-9.63	1.88	-2.52	4.27	-4.27	5.67	-7.06
Quicksand	20.38	-11.12	1.87	-2.65	4.21	-4.45	5.60	-7.24
Buckhorn Lake	18.13	-12.27	0.63	-3.51	3.84	-4.09	6.00	-6.04
London	21.97	-9.18	0.96	-3.29	5.88	-2.32	6.66	-5.77
Somerset	26.75	-7.78	1.30	-3.80	5.31	-4.23	7.63	-6.30
Cumberland Gap	20.80	-14.40	0.30	-4.44	4.62	-4.30	7.75	-5.93

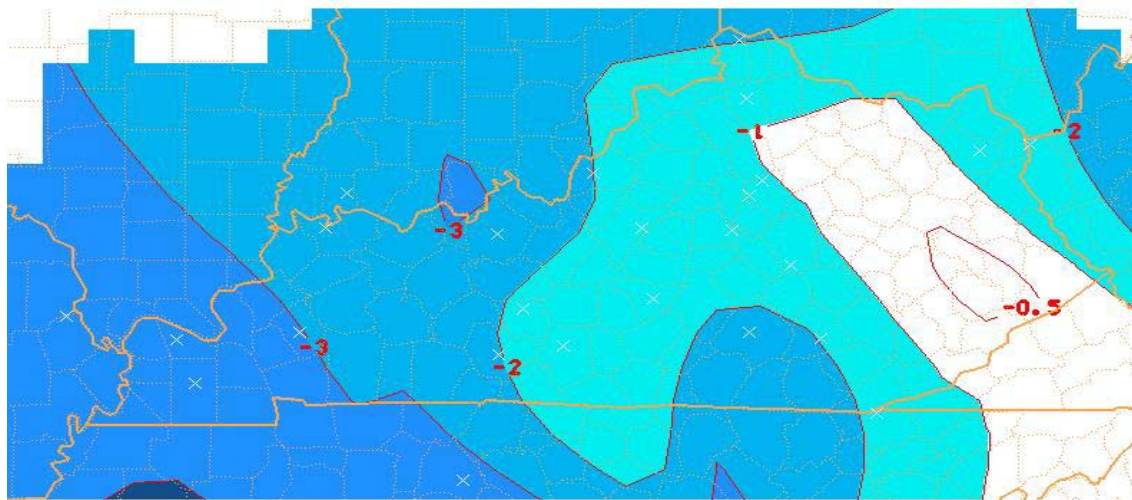
Climatic Division	Normal Precip. Water Year	Normal Precip. Calendar Year	Percent of Normal Precipitation				
			Water Year	Calendar Year	30 Day	60 Day	90 Day
Western (1)	44.84	32.59	83	69	17	68	55
Central (2)	44.51	32.86	85	80	72	101	74
Bluegrass (3)	39.90	29.79	86	81	92	97	77
Eastern (4)	42.52	31.52	69	63	68	71	59

August precipitation continues to lag for the majority of the state despite recent mostly-localized rainfall events. Precipitation for the past 30 days in the Eastern, Bluegrass and Central climatic divisions averaged 77 percent of normal (68, 92 and 72 percent of normal respectively) while the Western climatic division received an average of only 17 percent of normal.

For the 30-day period ending Aug. 22, 2007, average precipitation amounts of 1 to 5 inches were measured across the Central, Bluegrass and Eastern climatic divisions. Lesser amounts, about 0 to 3 inches, were measured across the Western climatic division. Statewide, the combined precipitation for the months of January through July of this year ranked as the sixth driest for the period since at least 1895 -- the first year of the instrumental record.



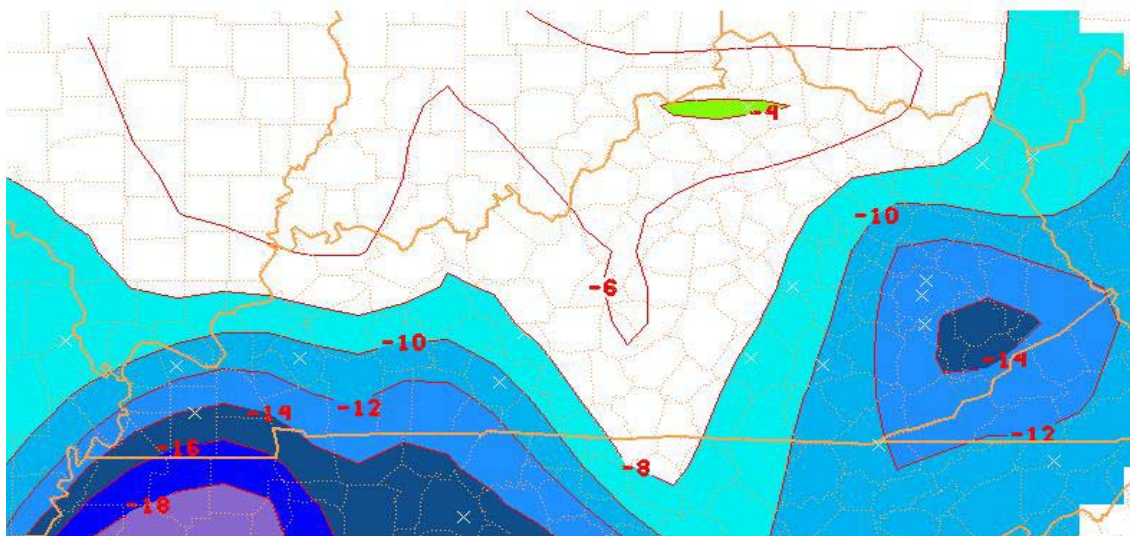
ATTENTION: One of the best tools to assess the amount and distribution of precipitation in Kentucky is the National Weather Service's [Precipitation Analysis Product](#). Data can be displayed for many different time frames and can be selected to show not only the amounts, but also the deficits and percentages of normal for each time frame.



08/21/07 - 30 Day Precip Deviation from Normal (inches)
Ending 7 pm Yesterday



UK
University of Kentucky
College of Agriculture

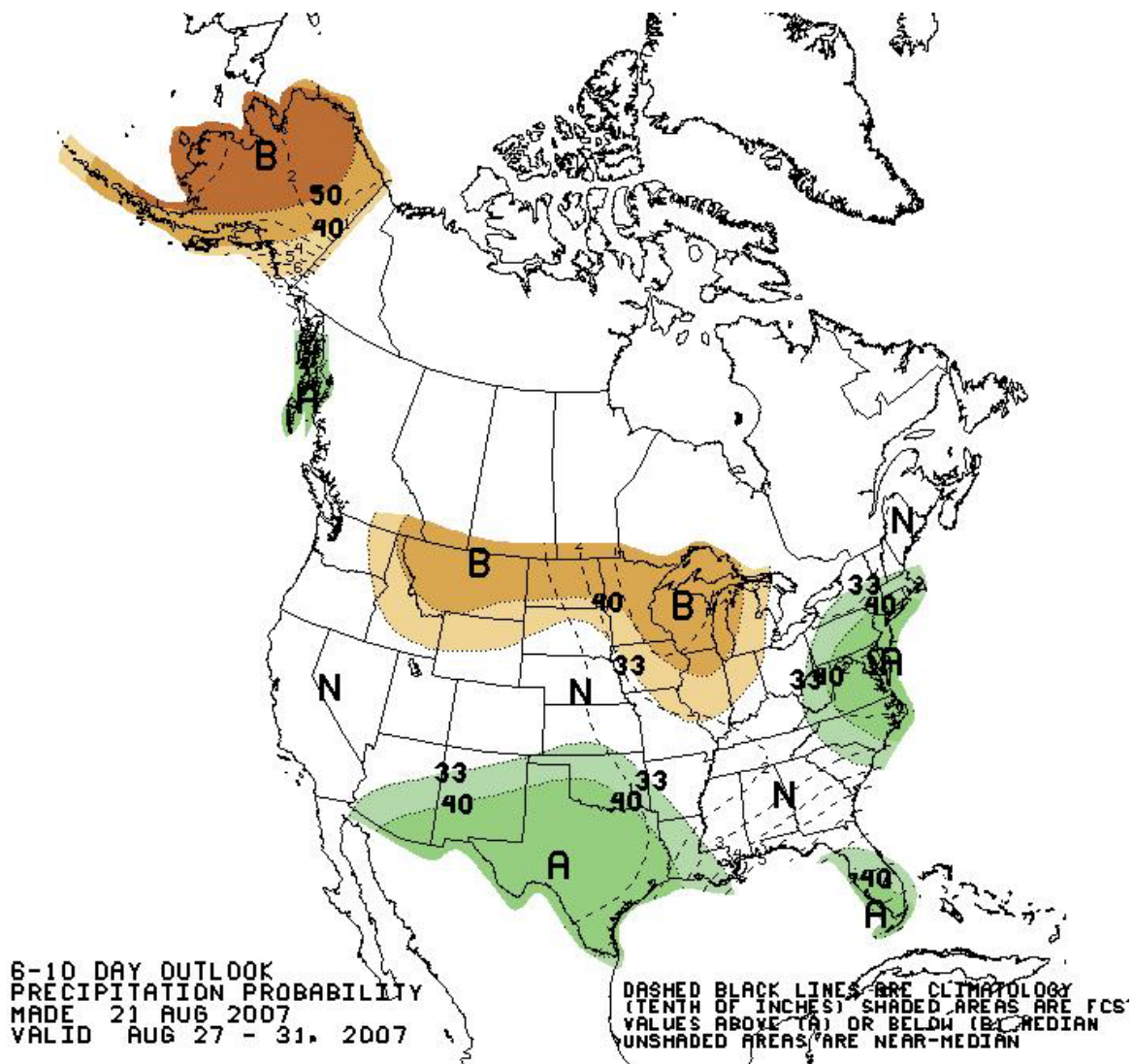


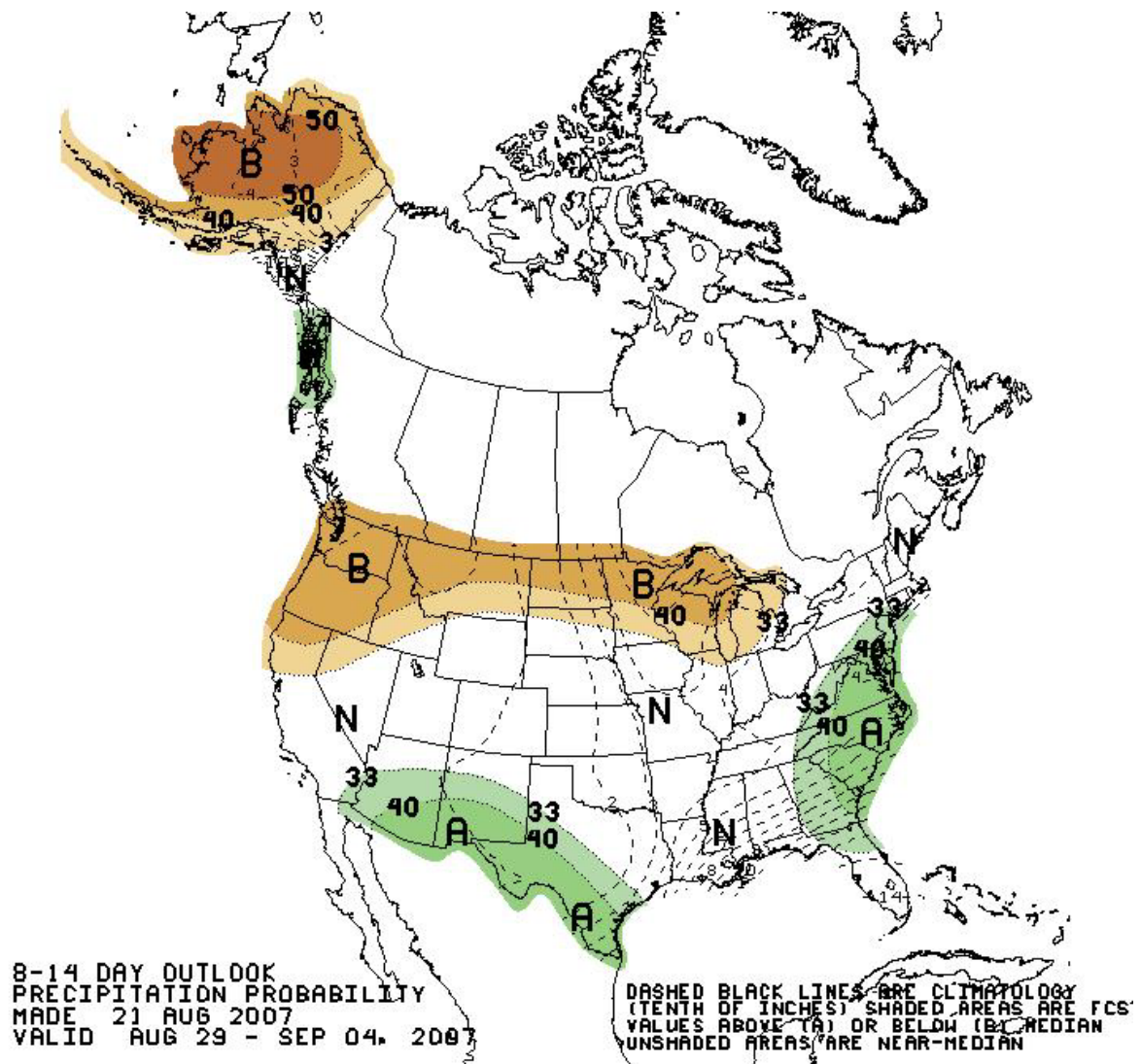
08/21/07 - Precip Deviation from Normal Since Jan 1 (inches)
Ending 7 pm Yesterday



UK
University of Kentucky
College of Agriculture

For the year, the largest deficits remain in the southern portions of the Western and Eastern climatic divisions. Ten to 18-inch precipitation deficits have built in parts of the Purchase area of the west. The headwaters of the Kentucky, Licking, Cumberland and Big Sandy river basins in the east have areas with deficits from 10 to 15 inches for the year. Central and northern Kentucky deficits range from 4 to 8 inches in the Bluegrass and parts of south-central Kentucky with an area centered around Williamstown remaining slightly above-normal.





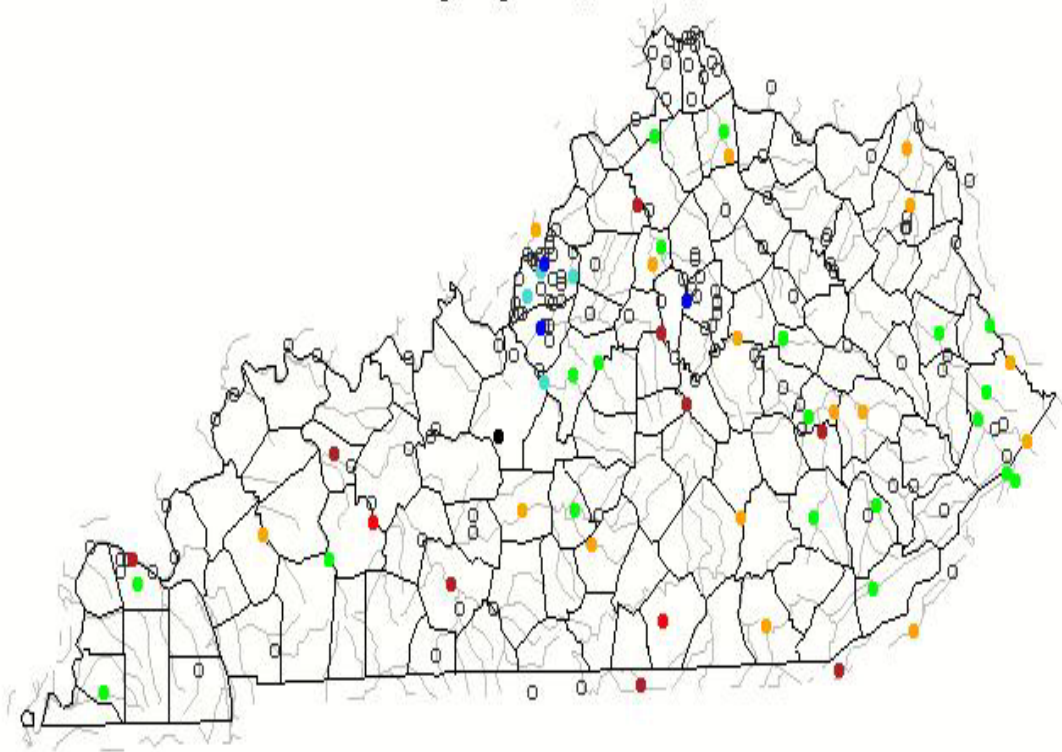
Both short-term outlooks and outlooks for the next one to three months indicate equal chances for below-normal, normal and above-normal rainfall for the state.

Hydrology

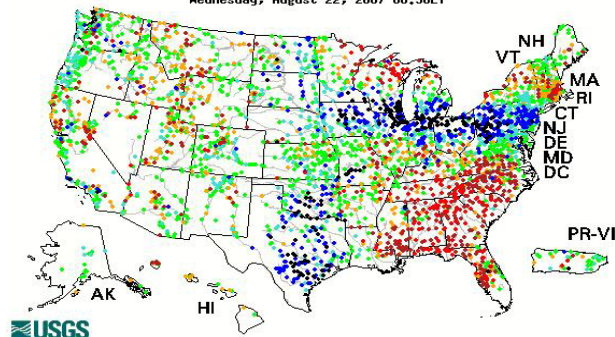
STREAMFLOWS

The [U.S. Geological Survey](#) maintains a [real-time stream gauging network](#) that monitors flows in all major river basins in Kentucky. Measurements of streamflow are a very good indicator of the longer-term hydrologic impacts of drought. During the developing stages of drought, streamflows provide valuable information on the severity and regional extent of emerging problems. Streamflow data is evaluated relative to the long-term record to determine drought intensity and identify potential problems associated with water shortages. Once a drought has matured, streamflow measurements are critical at many locations where water withdrawals have the potential to cause adverse environmental impacts to streams.

Wednesday, August 22, 2007 08:30ET



Wednesday, August 22, 2007 08:30ET



 **Updated Aug. 22, 2007** 

The rains of Aug. 20-21, 2007 improved streamflow conditions across an area including the northern Green, most of the Salt, and the lower Kentucky River basins. The Salt River basin appears to have benefited the most, but spotty rainfall in the headwaters and other tributaries of the Kentucky River basin has improved flows in the mainstem of the Kentucky River. Also worth mentioning, is the Nolin River at White Mills which has gone from all-time current low flows to record highs for the day. Without continued timely precipitation, expect many streamflows to return to below-normal in the coming week.

Drought in 2007 has been widespread and severe, but with only a few exceptions, precipitation events through July and now into August have maintained acceptable levels of flow in most streams, even in the hardest hit areas of western and southeastern Kentucky.

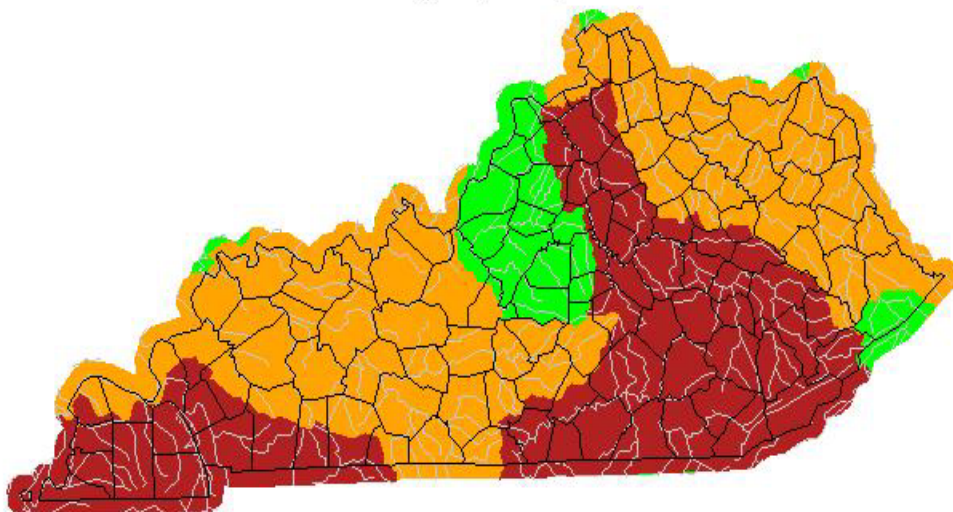
Weekly and Monthly Streamflow

For a slightly longer-term perspective of streamflow conditions across Kentucky, the United States Geological Survey computes average flows for the previous seven, 14 and 28 days. The resulting average streamflow values are categorized relative to the long-term record and assigned levels of severity based on the frequency that similar magnitudes of low-flow have occurred in the past. By averaging over a period of several days to several weeks, the values on the map are more indicative of longer-term conditions than daily average or real-time streamflow measurements.

 **Updated Aug. 22, 2007** 

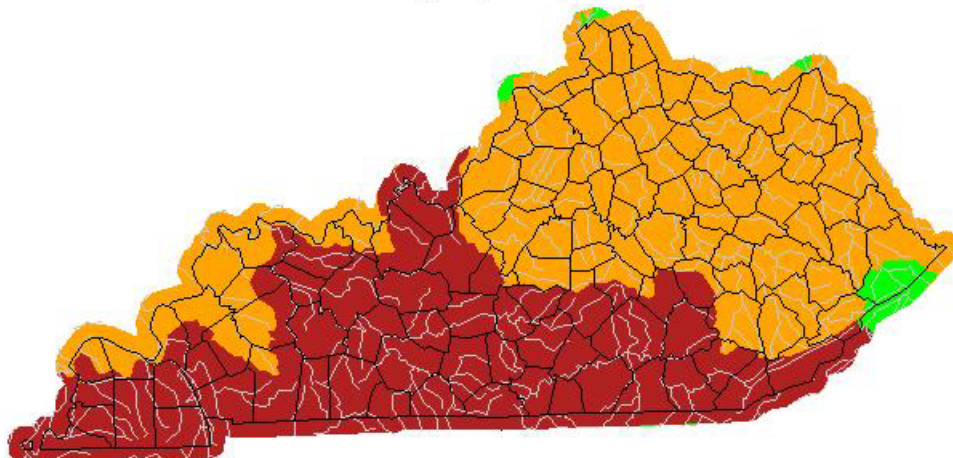
Seven-Day Average Streamflow

Tuesday, August 21, 2007



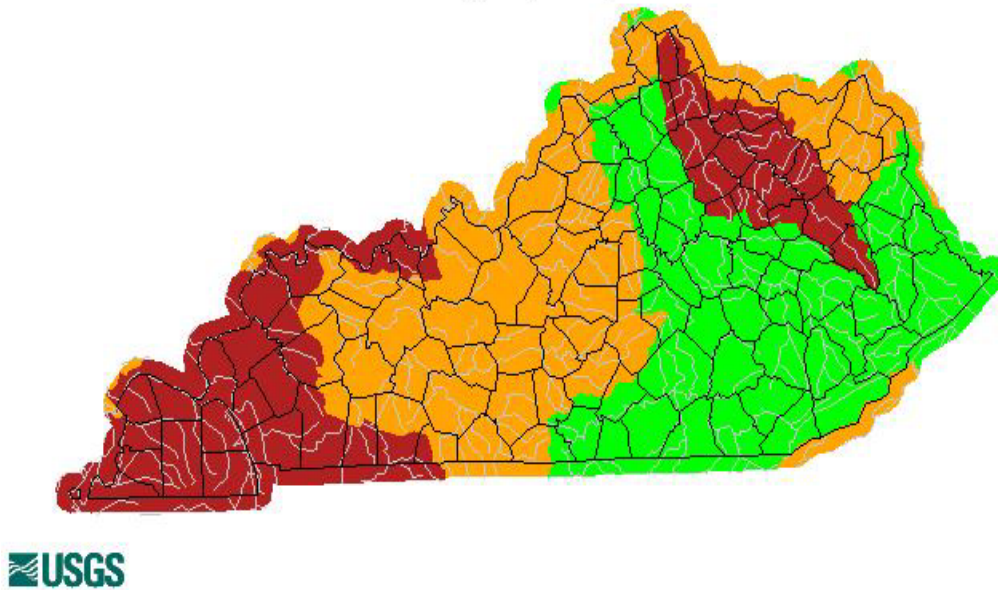
14-Day Average Streamflow

Tuesday, August 21, 2007



28-Day Average Streamflow

Tuesday, August 21, 2007



The 28-day average streamflow indicates that flows are significantly below normal in the Licking river basin, Lower Cumberland river basin, Tradewater river basin, western portions of the Green river basin and throughout the Purchase region. Elsewhere, long-term flows remain below normal in the Green and Little Sandy river basins. Flows in the Kentucky, Salt, Upper Cumberland and Big Sandy are low but within a normal range for flows at this time of year. Outlooks for the remainder of August indicate a continuation of warmer and drier than normal conditions. Water availability for water supplies, irrigation and other uses may be adversely affected as streamflows continue to decline.

Lakes and Reservoirs U.S. Army Corps of Engineers Projects

Another useful measure of the impact that drought is having on a region is the status of area lakes and reservoirs. The Division of Water monitors data from 12 projects operated by the U.S. Army Corps of Engineers (USACE) from three USACE districts: [Louisville](#), [Huntington](#) and [Nashville](#). These projects strive to maintain reservoirs at pool levels consistent with the operating guidelines as part of the larger mission of flood control and navigation in the Ohio and Mississippi rivers. Beginning in April, the releases from the reservoirs are managed to allow filling to the "normal summer pool elevation." Significant precipitation deficits in the basin above the reservoir can adversely affect the attainment of normal summer pool elevation. This, in turn, may result in low flows in the river below the project when releases from the reservoir are reduced to the minimum needed for water quality and aquatic habitat.

By examining the data for "current pool elevation" and "current outflow," valuable information about the status of large headwater areas above the USACE reservoirs can be obtained.

 **Updated Aug. 22, 2007** 

**United States Army Corps of Engineer Reservoir Information
Updated Aug. 22, 2007**

August 22, 2007				
Basin	Project	Current Outflow (cfs)	Normal Summer Pool Elevation (ft)	Current Pool Elevation (ft)
Little Sandy	Grayson	25.5	645	642.9
Big Sandy	Dewey	27.2	650	650.5
	Fishtrap	76.3	757	756.5
	Yatesville	22.3	630	629.5
	Paintsville	11.8	709	708.8
Licking	Cave Run	50.0	730	729.7
Kentucky	Carr Creek	5.0	1027	1027.1
	Buckhorn	40.0	782	781.7
Salt	Taylorsville	32.0	547	544.8
Green	Green River	49.0	675	674.4
	Nolin	49.0	515	515.3
	Barren River	53.0	552	548.0
	Rough River	50.0	495	494.9

As of Aug. 22, 2007, reservoir levels remain below the normal summer pool elevation at Taylorsville Lake in Spencer County, Green River in Taylor County, Barren River Lake in Barren County and Grayson Lake in Carter County. It is noteworthy that both Barren River and Rough River lakes have been at or near the minimum release since mid-March, further evidence that the current drought conditions have been under development for some time.

Small Lakes and Water Supply Reservoirs

The Division of Water will monitor selected small water supply reservoirs when conditions indicate that water supplies may be threatened by persistent drought. While many small water-supply lakes are not abnormally low, they continue to decline under the stress of high temperatures and lack of precipitation. Increased customer demand has forced a number of these water systems to call for conservation measures.